12S is started. A lack [or an error of] of a portion of, or an error in, the bit stream 14 can be detected from, for example, that a decoded value exceeds a range specified in advance or an unexpected code word appears when the bit stream 14 is decoded. When the SFSC 16 is detected and synchronization of the subframe layer 12S is established, the SFNT 17 and the SFNS 18 are examined as stated above, the block layer 13S is decoded and regenerated, and the subframe 12 which is a set of the regenerated blocks 13 is placed in time and space positions instructed by the SFNT 17 and the SFNS 18.

According to the first embodiment of this invention, if a part of the bit stream 14 [lacks] is lacking or an error occurs in the bit stream 14, synchronization of the decoding is lost and the decoding becomes unfeasible, but correct decoding becomes possible immediately after a subframe 12 in trouble.

As having been described the above first embodiment by way of an example, it is alternatively possible that the frame 11, the subframe 12 and the block are in different sizes and shapes. A bit length of each encoded information may be different from that of the above encoded information, or the frame layer 19 may be omitted, in addition.

According to a second embodiment of this invention, description will be now made of a method for encoding digital moving picture signals which can suppress degradation of a reproduced picture to a small extent if a subframe including a picture moving in relation to time cannot be decoded. Incidentally, it is possible here to employ a decoding method similar to that of the first embodiment.

In the encoding method of this embodiment, one frame 11 of digital moving picture signals is composed of, for example, 352x288 pixels. The frame 11 is divided into blocks each composed of 16xl6 pixels. In other words, one frame 11 is composed of 22 blocksx18 block lines 21. The block line 21 corresponds to the subframe 12 mentioned above.

In the encoding method of this embodiment, each block 13' is encoded from the uppermost block line 21, as shown in FIG. 8, to generate encoded information. The encoded information of each block 13' is generated in an encoding method of, for example, motion detection, prediction, orthogonal transform, quantization, variable length coding, etc., the number of coding bits of which is not fixed. More specifically, the number of coding bits of a block 13' which is difficult to be encoded is large, whereas the number of coding bits of a block 13' which is easy to be encoded is small. In the encoding method of this embodiment, a set of blocks 13 or 13'composes a subframe 12 (or a block line 21) which is a unit of encoding, but the number of blocks 13 or 13' included in one subframe 12 or 12' is not fixed.

A manner of generating a bit stream 14 in the encoding method of this embodiment and a structure of a subframe layer 12S will be now described with reference to FIG. 6. When one frame is encoded, an identifier of a frame layer is encoded, and an FSC 15 is placed in a bit stream 14. Next, the identifier of the subframe layer 12S, a time number and a space number of that subframe, and a quantization characteristic of that subframe are encoded together, and code words of an SFSC 16, an SFNT 17, an SFNS 18 and an SFQUANT 19 are placed in the bit stream 14. At the same time, block coding bit number integrated value B-add is set to zero. Following that, a block 13 is encoded and encoded information of the block 13 composed of variable codes is placed in the bit stream 14. Concurrently, the coding bit number B of this block 13 is added to B-add. Namely, an equation, B-add=B-add+B, is computed. Similarly, blocks 13 are encoded successively, encoded information 20 of each block 13 is placed in the bit stream 14,and a calculation of B-add=B-add+B is repeated each time. If the B-add exceeds a subframe interval SFd when encoding of a certain block 12 is completed, an identifier of the subframe, a time number and a space number of that subframe and a quantization characteristic of that subframe are encoded, and code words of an SFSC 16, an SFNT 17, an SFNS and an SFQUANT 19 are placed in the bit stream 14. At the same time, a block coding bit integrated value B-add is set to zero. In other words, a new subframe layer 12S is started to be formed from that point.

The subframe interval SFd is set to, for example, 540 bits. Therefore, if one frame is encoded with, for example, 6400 bits in the encoding method of this embodiment, 12 subframes 12 exist in one frame since 6400/540=11.85.

In the encoding method according to this embodiment, the number of blocks 13 included in a subframe 12 is varied according to a quantity of generated information of the blocks included in one subframe, thereby varying a spatial size of the subframe 12, as stated above. More specifically, a subframe 12 including a block which is difficult to be encoded becomes small, whereas a subframe 12 including a block 13 which is easy to be encoded becomes large. FIG. 9 shows an example of a structure of subframes formed in the encoding method of this embodiment.

According to [th e] the second embodiment of this invention, a subframe 12 including a block 13 which contains a motion in relation to time, and is thus difficult to be coded is made smaller in relation to space. If such subframe 12 cannot be decoded, it is possible to suppress degradation of a quality of a reproduced picture to a small extent. In a region within a frame in which no motion in relation to time exists and degradation of the picture quality is hardly detected even if the decoding is unfeasible, a size of one subframe is large in relation to space, which allows a less volume of side information such as the subframe identifier SFSC 16, subframe number **SFNT 16** and subframe number **SFNT 17.** This can prevent an encoding efficiency from being lowered.

As having been described the second embodiment by way of an example, it is alternatively possible that the frame 11, subframe 12 and the block 13 are in different sizes and shapes. It is also possible to employ values of a quantity of codes of one frame and a subframe interval SFD different from those employed in the above example.

As obvious from the above embodiments, this invention enables correct decoding of each subframe 12 as a unit in relation to time even if a part of the bit stream 14 is missing or an error occurs therein.

Further, according to this invention, it is possible to suppress degradation of a quality of the reproduced picture to a small extent if a subframe 13 including a block which is in motion in relation to time cannot be decoded.

Still further, in a region within a frame in which no motion in relation to time exists and degradation of a quality of the reproduced picture quality is hardly detected even if the decoding is unfeasible, side information of the region is allowed to be in a small volume so that it is possible to prevent an encoding efficiency from being lowered.

What is claimed is:

[1. A method for encoding digital motion picture signals of a frame, comprising the steps of:

dividing said frame into plural blocks each including NxM pixels;

forming a subframe composed of a set of said blocks, said subframe being a unit to be encoded;

setting an identifier to said subframe to identify said subframe; and

specifying a frame to which said subframe belongs by adding to said identifier time position information to said identifier representing an order of displaying said subframe;

encoding said time position information along with said subframe, and

multiplexing said encoded time position information and a bit stream of said encoded subframe to transmit said encoded time position information and said bit stream.]

[2. A method for encoding digital motion picture signals of a frame, comprising the steps of:

dividing said frame into plural blocks each including NxM pixels;

forming a subframe composed of a set of said blocks, said subframe being a unit to be encoded; and

varying the number of said blocks included in said subframe according to a quantity of information generated by encoding each block to vary a spatial size of each of said subframes included in each frame.]

[3. A method for encoding digital motion picture signals of a frame, comprising the steps of:

dividing said frame into plural blocks each including NxM pixels;

forming a subframe composed of a set of said blocks, said subframe being a unit to be encoded;

setting an identifier to said subframe to identify said subframe;

specifying a frame to which said subframe belongs by adding to said identifier time position information represent-ing an order of displaying said subframe;

encoding said time position information along with said subframe, and

multiplexing said encoded time position information and a bit stream of said encoded subframe to transmit said encoded time position information and said bit stream; and

varying the number of said blocks included in said subframe according to a quantity of information generated by encoding each block to vary a spatial size of each of said subframes included in each frame.]

[4. The method for encoding digital motion picture signals of a frame according to claim 2, wherein each of said subframes included in said frame has an equal sum of quantities of generated information of said blocks included in said subframe.]

[5. The method for encoding digital motion picture signals of a frame according to claim 3, wherein each of said subframes included in said frame has an equal sum of quantities of generated information of said blocks included in said subframe.]

[6. A method for encoding and decoding digital motion picture signals of a frame, comprising the steps of:

dividing said frame into plural blocks each including NxM pixels;

forming a subframe composed of a set of said blocks, said subframe being a unit to be encoded;

setting an identifier to said subframe to identify said subframe;

specifying a frame to which said subframe belongs by adding to said identifier time position information representing an order of displaying said subframe;

encoding said time position information along with said subframe;

multiplexing said encoded time position information and a bit stream of said encoded subframe to transmit said encoded time position information and said bit stream; and

decoding each of said subframes appropriately in relation to time by decoding and using said time position information to form said frame of said digital moving picture signals.]

[7. A method for encoding and decoding digital motion picture signals of a frame, comprising the steps of:

dividing said frame into plural blocks each including NxM pixels;

forming a subframe composed of a set of said blocks, said subframe being a unit to be encoded;

varying the number of said blocks included in said subframe according to a quantity of information generated by encoding each block to vary a spatial size of each of said subframes included in each frame; and

decoding each of said subframes to form said frame of said digital moving picture signal.]

[8. A method for encoding and decoding digital motion picture signals of a frame, comprising the steps of:

dividing said frame into plural blocks each including NxM pixels;

forming a subframe composed of a set of said blocks, said subframe being a unit to be encoded,

setting an identifier to said subframe to identify said subframe;

specifying a frame to which said subframe belongs by adding to said identifier time position information representing an order of displaying said subframe;

encoding said time position information along with said subframe;

multiplexing said encoded time position information and a bit stream of said encoded subframe to transmit said encoded time position information and said bit stream;

varying the number of said blocks included in said subframe according to a quantity of information generated by encoding each block to vary a spatial size of each of said subframes included in each frame; and

decoding said subframe appropriately in relation to time by decoding and using said time position information to form said frame of said digital moving picture signal.]

[9. The method for encoding and decoding digital motion picture signals of a frame according to claim 7, wherein each of said subframes included in said frame has an equal sum of quantities of generated information of said blocks included in said subframe.]

[10. The method for encoding and decoding digital motion picture signals of a frame according to claim 8, wherein each of said subframes included in said frame has an equal sum of quantities of generated information of said blocks included in said subframe.]

[11. The method for encoding digital motion picture signals of a frame according to claim 1, wherein said step of adding time position information comprises adding the time information to each subframe of said frame.]

[12. The method for encoding digital motion picture signals of a frame according to claim 11, further comprising the step of maintaining substantially constant a quantity of information generated for each subframe within said frame thereby to vary spatial dimensions represented by each said subframe.]

[13. The method for encoding digital motion picture signals of a frame according to claim 1, further comprising the step of maintaining substantially constant a quantity of information generated for each subframe within said frame thereby to vary spatial dimensions represented by each said subframe.]

[14. The method for encoding and decoding digital motion picture signals of a frame according to claim 6, wherein said

step of adding time position information comprises adding the time information to each subframe of said frame.]

[15. The method for encoding digital motion picture signals of a frame according to claim 14, further comprising the step of maintaining substantially constant a quantity of information generated for each subframe within said frame thereby to vary spatial dimensions represented by each said subframe.]

[16. The method for encoding digital motion picture signals of a frame according to claim 6, further comprising the step of maintaining substantially constant a quantity of information generated for each subframe within said frame thereby to vary spatial dimensions represented by each said subframe.]

17 (Added). A method for encoding digital motion picture signals of a frame, comprising:

dividing said frame into plural blocks each including NxM pixels;

forming a subframe composed of at least one of said blocks, said subframe being a unit to be encoded;

setting an identifier to said subframe to identify said subframe;

specifying a frame to which said subframe belongs by adding time position information to said identifier, the time position information representing an order of displaying said subframe;

specifying a spatial position of said subframe within said frame by adding spatial position information to said identifier, the spatial position information representing said spatial position of said subframe within said frame;

encoding said time position information and said spatial position information along with said subframe, and

multiplexing said encoded time position information, said encoded spatial position information and a bit stream of said encoded subframe to transmit said encoded spatial position information, said encoded time position information and said bit stream.

18 (Added). A method for encoding and decoding digital motion picture signals of a frame, said method comprising:

dividing said frame into plural blocks each including NxM pixels;

forming a subframe composed of at least one of said blocks, said subframe being a unit to be encoded;

setting an identifier to said subframe to identify said sub-frame;

specifying a frame to which said subframe belongs by adding time position information to said identifier, the time position information representing an order of displaying said subframe;

specifying a spatial position of said subframe within said frame by adding spatial position information to said identifier, the spatial position information representing said spatial position of said subframe within said frame;

encoding said time position information and said spatial position information along with said subframe;

multiplexing said encoded time position information, said encoded spatial position information and said encoded subframe to transmit said encoded spatial position information, said encoded time position information and said encoded subframe as an encoded bitstream;

receiving said encoded bitstream;

detecting said identifier to extract said encoded time position information and said encoded spatial position information from said encoded bitstream;

decoding said extracted encoded time position information to obtain decoded time position information;

decoding said extracted encoded spatial position information to obtain decoded spatial position information; and

decoding said encoded subframe to form said frame according to said decoded spatial position information and said decoded time position information.

19. (Added) A method for decoding an encoded bitstream, said method comprising:

(a)receiving said encoded bitstream containing an identifier, an encoded subframe obtained by encoding a subframe composed of at least one of said blocks, and an encoded spatial position information representing a spatial position of said subframe within a frame composed of a plurality of subframes and an encoded time position information representing an order of displaying said subframe,

wherein

said identifier is set to said encoded subframe to identify said subframe,

said encoded time position information is added to said identifier by specifying a frame to which said subframe belongs, and

said encoded spatial position information is added to said identifier by specifying a spatial position of said subframe within said frame;

(b) detecting said identifier to extract said encoded spatial position information and said encoded time position information from said encoded bitstream;

(c) decoding said extracted encoded time position information to obtain decoded time position information;

(d) decoding said extracted encoded spatial position information to obtain decoded spatial position information; and

(e) decoding said encoded subframe to form said frame according to said decoded spatial position information and said decoded time position information.

20 (Added). The method for decoding according to claim 19, wherein in the case any conflict is detected in at least one of the decoded time position information and the decoded spatial position information corresponding to current encoded subframe, a procedure of detecting said identifier is executed to establish synchronization of a subframe layer without decoding said current encoded subframe.

21 (Added). The method for decoding according to claim 19, wherein in the case any conflict is detected in a process of decoding a current block layer within said encoded subframe, a procedure of detecting said identifier is executed to establish synchronization of a subframe layer without decoding said current block layer